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ABSTRACT

The objective of this project was to develop computer literacy and a working knowledge of microprocessor applications and digital circuits for teachers in selected vocational subject areas. Twenty-four vocational trade and industry teachers completed 16 hours of training in microprocessor skills for computerized instruction and curriculum update. Teachers were assigned to three groups with different interests: (1) electronics, electric wiring, industrial electric, and air conditioning with interest in solid state and programmable controls for the operation of electrical equipment; (2) drafting and design with interest in computer-assisted drafting; and (3) commercial art with specific interest in the creative and advertising art aspects of the computer. Software was selected to introduce computer-assisted instruction into vocational classes. Curriculum addendums were developed to reflect high technology competencies. Computer-assisted instruction was used to provide simultaneous instruction to a wide range of students, and continual emphasis was placed upon the elimination of sex bias in trade and industry classrooms that teach high technology competencies. (Outlines of the training undergone by the three groups of teachers are appended. These detail time, presenter, description of training, and impact of training.) (YLB)

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FINAL REPORT

TEACHER TRAINING FOR HIGH TECHNOLOGY
(Contract number 94-4018)

Thomas L.Goettmann

School District of Pittsburgh
341 South Bellefield Ave.
Pittsburgh,Pa.15213

August 9,1984

PENNSYLVANIA DEPARTMENT OF EDUCATION
BUREAU OF VOCATIONAL EDUCATION
VOCATIONAL PROGRAM SUPPORT SERVICES SECTION

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ABSTRACT

94-4018 Teacher Training For High Technology

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$42,008.00 Federal
7/1/83 to 6/30/84

The objective of this project was to develop computer literacy and a working knowledge of microprocessor applications,and digital circuits for teachers in selected vocational subject areas.

Objectives

1. To train 24 vocational Trade and Industry teachers to use microprocessor skills for computerized instruction and curriculum update.
2. To implement computer assisted instruction in Trade and Industry classrooms.
3. To prepare 24 teachers to update their vocational Trade and Industry curriculum to include high technology competencies.
4. To train 24 Trade and Industry teachers in instructional techniques that allow the simultaneous instruction of a variety of skills to a wide range of students.
5. To train 24 Trade and Industry teachers to teach without sex bias.
6. To develop a model for a sex fair Trade and Industry classroom which teaches high technology competencies to a wide range of students.

OUTCOMES

1. Sixteen hours of computer literacy was completed.
2. With the use of selected software computer assisted instruction has been introduced in vocational classes
3. Teachers developed of a working knowledge of microprocessor applications
4. Curriculum addendums were developed reflecting high technology competencies.
5. Computer assisted instruction is being used to provide simultaneous instruction to a wide range of students.
6. Continual emphasis is being placed upon the elimination of sex bias.

AUDIENCE

The resulting report and curriculum addendums can be a resource to the Bureau of Vocational Education,and others involved in high technology development.

PUBLISHED MATERIALS

Final report
Curriculum addendums

BACKGROUND

The Pittsburgh School District has made a committment to the teaching of high technology skills.This committment is reflected in the following programs:

- .The Schenley High School "High Tech" Magnet program with its electro-mechanical (robotic)core curriculum.
- .Computer numerically controlled machining instruction at both the secondary and post secondary level.
- .Computer assisted drafting taught at the post secondary level and being introduced in the 1984-85 school year at the secondary level.
- .Programmable control instruction at the post secondary level.
- .Computer assisted type-setting at the post secondary level.
- .Digital electronics at the secondary and post secondary level.
- .Electro mechanical (robotics)at the post secondary level.
- . Current plans project a development of transisional curriculum from the secondary level to the post secondary in these areas.

Under normal conditions the Vocational teacher has problems staying abreast with his/her subject areas technological advances.The problem has now become a critical one with the advent of digital circuitry and microprocessor applications.This form of technology has almost reached the point where what we did yesterday is already obselete.With such rapid advancement the teacher is continually trying to catch up.With this thought in mind a series of on-going workshops were established to facilitate the implementation of some of the above programs.The participants were teachers from electronic,electric wiring,industrial electric,air conditioning,drafting and commercial art.

The format of these workshops provided 24 secondary and post secondary vocational teachers a minimum of 48 hours of computer,computer application, and digital circuitry training.The first 16 hours were devoted to basic computer instruction with the remaining time devoted to each subject area.Industrys role in the last 32 hours was central.It provided workshop leaders and visitation sites. Upon completion of the workshops curriculum addendums were written in each subject area.The addendums addressed computer assisted instruction and high technology skills.

METHODS

The implementation of the project presented two distinct problems.

1. How to conduct 48 hours of training with the least classroom disruption.
2. Satisfy the interests of 24 vocational teachers from six different subject areas.

The decision was made to remove the teachers from the classroom one day a week for six consecutive weeks. Substitutes were assigned in advance and lesson plans provided. In this manner the individuals would benefit from full day sessions as opposed to many short concentrated sessions after school hours.

The second problem was resolved by the development of the seperate groups. The assignment of groups was based upon specific interest.

Group 1 Electronic, Electric wiring, Industrial Electric, and Air conditioning

Specific interest of solid state and programmable controls used for the operation of electrical equipment. Additionally programmable controls are microprocessors with digital circuitry adding to the interest of the electronics people.

Group 2 Drafting and design

Specific interest in computer assisted drafting

Group 3 Commercial art

Specific interest in the creative and advertising art aspects of the computer.

With the formation of groups common and specific activities to meet the objectives of the project were developed. Following is a list of the activities used.

Common activities

Four hours - Lesson plans

After school hours, plan and begin to develop lesson plans to be used by substitutes.

Sixteen hours - Basic computer instruction

With computers/microprocessors being the focal point of this project 16 hours of basic computer instruction was given. The intent of the training was not to produce highly proficient operators or programmers, but rather as a introduction to the computer. Many participants had no prior computer experience and displayed reluctance to work with computers initially. However, attitudes changed after

several hours of experience.These 16 hours provided the core for later training.

Location of a site with sufficient computers was a problem,but was overcome when Triangle Tech, a local private school, offered the use of the 15 Apple computers in its CAD lab.This permitted formation of two groups of twelve,to be scheduled two days training each.Further,it provided for one person per computer.

Once the computer training was completed,industry moved to a role of prominence and the the specific groups were renewed.

Group 1,Fourteen Electrical teachers

specific activities

4 hours	Programmable Controls and their interface
	Discussion and hands-on
	Mr Edward Simms Sales Representative
	ASCI Marketing
4 hours	Solid state controls
	Discussion
	Mr Samuel Passafiume, President
	Advanced Mining Services
4 hours	Laboratory Instrument Control
	Discussion
	Mr John Schneider, Electrical Engineer
	Fisher Scientific Company
4 hours	Positioning tables and electronic circuits
	Discussion
	Mr John Trauguat Chief Engineer
	Aerotech Incorporated
8 hours	Advanced Electrical/Electronic Curriculums
	Discussion
	Mr Les Ragarese, Regional Sales Manager

Mr Lee Ennis, Director International Training

Mr Peter Dennish, Director Technical Writing

Lab-Volt Systems Incorporated

8 hours Industrial Site Visitations

Each of the 14 individuals involved was assigned to a full days observation at one of the industrial sites listed below.

Advanced Mining Services,	solid state control
Aerotech Incorporated,	positioning tables
Anter Laboratories Incorporated,	robotics
Bell Telephone of Pennsylvania,	communications
Fisher Scientific Company,	instumentation
General Electric Apparatus Div.,	solid state control
Gulf Research and Development,	process control
IPAC Group,	environmental monitoring
Koppers Company,Chemical Plant,	process control
Marshall Electronics Division,	solid state control
U.S.Air,	Avionics
Westinghouse Electric Corp.,	solid state control

Oliver Reality Corporation (PPG Building)
The two air conditioning teachers visited this site to observe the" state of the art " in environmental control systems.

Group 2,Seven Drafting and Design teachers

specific activities

4 hours Introduction to CAD equipment and curriculums

Discussion

Mr Steve Beam

Monongehela Group

4 hours Advisory committee meeting

8 hours CAD site visitations

Two groups were formed with each group visiting 3 of the sites listed.Each site offered a different CAD application.(e.g.mechanical,electrical,etc.)

Alcoa Corporation

Design Service Group Incorporated

Westinghouse Electric Corporation

Keystone Drafting Service

8 hours Site visitation

Hands on CAD training

Triangle Technical Institute

8 hours Industrial Site visitation

Each of the 7 individuals involved was assigned to a full days observation at one of the sites listed below.

Deci Corporation

Keystone Drafting Service

PPG Industries

Union Switch and Signal

U.S.Steel,American Bridge Division

Westinghouse Electric Corporation

Westinghouse Electric Corporation,Transportation Division

Group 3 Three commercial art teachers

specific activities

4 hours Introduction to CAD equipment and curriculums.

Discussion

Mr Steve Beam

Monongahela Group

4 hours Site visitation

Demonstration of CAD system

Algor Interactive Systems

4 hours — Site visitation

Pittsburgh Press Newspaper, Advertising Department

4 hours — Site visitation

Genigraphics Incorporated

Computer generated slides presentations

8 hours — Site visitation

Buhl Science Center

Hands-on experience computer generated art

8 hours — Site visitation

Each of the individuals involved was assigned to a full days observation in the art department of a site listed below.

KDKA Television

WPXI Television

WTAE Television

Upon completion of all specific activities the groups again combined for additional common activities.

2 hours — In-service

Sex Bias

Ms Linda Thomas

Vocational Staff

10 hours — In-service

Curriculum writing

Project Coordinator

At the on-set of the project, computers to implement the computer assisted instruction phase had not been purchased. It was felt that available software should dictate the computer purchase. Concurrent to the above

activities an software search was conducted by the project coordinator,resulting in the purchase of Apple Computers.Based upon the fact considerable Apple run software is written for vocational education.Listed below are some of the software packages now being successfully used in the project.

Hi-Res Architectural Design
Special Effects
Complete Graphics II
Graphics Magician
Banners
Basic Concepts of Electricity
Resistor Color Code
Electrical Fundamentals
Circuit Graphics
Hi-Res Electronic Design

ANALYSIS

Objective 1. To train 24 vocational Trade and Industry teachers to use microprocessor skills for computerized instruction and curriculum update.

Objective #1 was the base from which the total project would expand and its attainment was paramount. Probably the most postive sign of progress was evidenced by the change in attitude of the individuals.In some cases outright fear of the computer was voiced.This changed ,however,when it was discovered the computer was a machine easily controlled by the operator.The initial 16 hours of training introduced the individuals to the computer and its perhiperal devices.It provided a level of confidence needed to implement computer assisted instruction into the involved classes.In particular it prepared the Drafting and Commercial Art teachers for their full day hands-on CAD and Computer Art experience.

Another positive sign occured when the computers were placed in the classrooms.They became an immediate teaching tool, not something that sat until the teacher had time to learn or overcome his/her reservations.

Objective 2. To implement computer assisted instruction in Trade and Industry classrooms.

The introduction of CAI into the classes was a relatively smooth process.Prior planning provided for the method of integrating CAI without disruption to the normal curriculum.The selection of appropriate software enhanced the transition.A prime example of this was the drafting class using the Hi-Res Architectural Design software.Although it is basically a graphics package,it was used as a low level CAD system.Thus providing the students

with an introduction to CAD.

The electrical software was used in both tutorial and student evaluation modes. Given circuit specifications and using the Hi-Res Electronic design software, the student is required to graphically build the circuit and present the instructor with a printed schematic for grading.

The Commercial Art class experienced the most difficulty in introducing CAI, due not to poor attitude or inappropriate software, but rather from a lack of equipment. Due to the creative nature of the subject digitizing tablets should be used, but money for their purchase was not available. In lieu of the digitizing tablets game paddles were used. The paddles inhibited freedom of movement, thus making creative art cumbersome.

Objective 3. To prepare 24 teachers to update their Trade and Industry curriculums to include high technology competencies

The preparation of high technology curriculum addendums was attained in the industrial phase. It afforded the individuals the opportunity to observe, question, and clarify, unlike most cases where information is derived from reading or brief encounters. By varying the subjects areas it could be determined what information is common in all applications, and what is restricted to a particular application. This information generated the impetus for curriculum addendum development. A few of the units developed are:

.Solid state refrigeration controls

.Solid state furnace controls

.Energy management systems

Objective 4. To train 24 Trade and Industry teachers in instructional techniques that allow the simultaneous instruction of a variety of skills to a wide range of students.

Objective 5. To train 24 Trade and Industry teachers to teach their students without sex bias.

Objective 6. To develop a model for a sex fair Trade and Industry classroom which teaches high technology competencies to a wide range of students.

The Pittsburgh Schools Vocational Department has for a number of years mantained a separate component to address these issues. The Project Liason staff provides both Learning and Rehabilitation counselors, plus a coordinator of non-traditional training. The existence of this group has

provided on-going training geared to meet these objectives.Provided is a continual communications link between the learning counselor and the classroom teacher.To supplement and reinforce this linkage a workshop on sex harassment was conducted within the project.

The introduction of CAI has enhanced the ability of the instructor to meet a varity of needs.Using the appropriate software students at any level can be remediated and experience a measure of success.

A further benefit derived from industrial visitations was the opportunity to observe and talk to individuals working in non-traditional roles and different competency levels.While contact is maintained on a one to one basis between the coordinator of non-traditional training and the teachers,group sessions are frequent.The industrial observations provided an excellent prelude for such a workshop conducted by the non-traditional coordinator.

The subject of the session was sex harassment.It dealt not with the overt forms,but rather with the unthinking subtle forms.It created an awareness of how unwittingly innocent remarks can sometimes result in major problems.It was a very effective session and was another positive step in the continuing effort to totally eliminate sex bias in the Pittsburgh Schools vocational programs.

CONCLUSIONS and RECOMMENDATIONS

Objective 1. To train 24 vocational Trade and Industry teachers to use microprocessor skills for computerized instruction and curriculum update.

The intent of this objective was to develop individuals capable of booting-up the computer and manipulating software programs rather than to develop programmers.Sixteen hours provided ample time to achieve this goal.Had the time been expanded the training would have become redundant or too complex,both impacting negatively on the effort.The boredom of redundancy is a minor problem,but the complexity of learning programming would have overwhelmed those just beginning to feel comfortable around a computer. The time frame used provided a cadre of teachers prepared to introduce the computer to their students,with their own sequence of training providing the model.

Objective 2. To implement computer assisted instruction in Trade and Industry classrooms.

The implemertation of this objective is a two fold effort.The first being the training of the teachers to use the computer,and the second being selection of appropriate software.While the training of the teacher is an important phase his/her effort can only be as good as the software provided.While talking with individuals from other school districts, I have learned that a policy exists where only one brand of computer can be purchased.Unfortunatly, in many cases a very limited amount of vocational oriented software exists, except for the Apple computer.

Within the Fittsburgh School District, the Vocational Department was given the freedom of computer choice.This gave us the opportunity for selection of a computer based upon relevant software,thus ensuring the success of CAI implementation.It is strongly recommended to anyone charged with computer purchases for vocational education.that you select your computer after having researched available software and its the computer expansion capabilities.

Objective 3.To prepare 24 teachers to update their Trade and Industry curriculums to include high technology competencies

The extensive and varied involvement of industry in this was a must.To even consider success of this objective without industries involvement would have been shear fallacy.As stated earlier the vocational teacher loses touch.To renew that contact who is better qualified than industrial representatives with their daily working knowledge of the subject.Through this contact it was determined what is new,where emphasis should be placed on the old,and to what degree.Some of this information is normally garnered through advisory committees,but the prolonged involvement of the project provided in-depth information needed to modify existing units and development new curriculum units.

Objective 4.To train 24 Trade and Industry teachers in instructional techniques that allow the simultaneous instruction of a variety of skills to a wide range of students.

Objective 5.To train 24 Trade and Industry teachers to teach their students without sex bias.

Objective 6.To develop a model for a sex fair Trade and Industry classroom which teaches high technology competencies to a wide range of students.

Inregard to the above objectives, as previously stated these issues are addressed in an on-going project.

The introduction of CAI to the class is enhancing these activities.Use of selected software can meet the varying needs of students.If properly used for remediation, not busy work, it can relieve the time consuming teacher effort of one on one remediation, and provide a measure of success to the student.Software can also provide an enrichment experience to the advanced student.

Overall this was a highly successful project for a number of reasons.First it brought together all teachers from the same subject area, for a prolonged period of time.The teachers represented both secondary and post secondary levels.providing a communications opportunity rarely offered.

Secondly it developed a broad link to industry that provided information relating to current technology.Information needed to update vocational subjects to meet todays industrial needs.Additional benefits were derived from the person to person contact,such as equipment donations,new advisory committee members, potential student employment sites,and offers of future in-service activities.

Thirdly it provided the vehicle for individuals to overcome reservations toward the computer.Once these barriers were down and the computers placed in the classroom attitudes were different.This interest has presented the only problem,in that equipment and software requests have now exceeded available funds.

Finally it provided the reassurance to the teachers that the Pittsburgh Schools Vocational Department is sincere in its committment to high technology, and that industry is more than willing to participate.

DISSEMINATION

The dissemination of this information will be primarily through this report, available from the Pennsylvania Department of Education.Bureau of Vocational Education,Vocational Program Support Services Section.An additional copy will be forwarded to the National Center for Research in Vocational Education.

School Pittsburgh School District — Electronics, Electrical Occupations — Participant Industri ' Elec. & Air Conditioning Position Teacher

Dates	Hours	Presenter	Description of Training	Impact of Training
10/6/83	2	Project Coordinator	Overview of Teacher Training for High Technology project and begin substitute teacher lesson plan development.	Provided common subject lesson plans to be used by substitutes for duration of project.
10/10/83	2	Project Coordinator	Continue lesson plan development	
10/17/83 10/24/83	8 8	Robert Morgan, Morgan's Computer & Education Center	Introduction to computer and peripheral devices. Training designed to provide skills necessary to introduce CAI into classrooms.	Developed a level of confidence in the operation of computers and created the motivation for remainder of project.
10/31/83	4	Edward Simms, ASCI Marketing	Introduction to programmable controls and interface busses. The use of ladder logic was covered and individuals had the opportunity for a hands-on programming experience.	It provided a first time experience with programmable controls and its normally open, normally closed logic.
10/31/83	4	Samuel Passafiume, President, Advance Mining Services	Discussion of various electrical components and their uses in solid state controls.	It provided the knowledge of how components are being modified and updated for use in these control circuits.
11/8/83	4	John Schneider, Fisher Scientific Company	Discussion of microprocessor, and digital circuitry in a laboratory setting. Also, covered were the required skill levels of a technician in this setting.	It provided a knowledge of what occurs in the Research and Development Laboratory.
11/14/83	8	Site visitation	Each participant was assigned to a full day's observation at an industrial site.	It provided the opportunity to observe and talk to individuals in industry. Many things can be talked about, but not fully understood unless observed, this session provided the chance to observe, question and clarify.
11/22/83	8	Les Raganese Lee Ennis Peter Dexnish, Lab-Voit Systems	Discussion of advanced electrical/ electronic curriculum.	It provided the opportunity to discuss areas of Electric/Electronics that are emerging in importance. After having had previous sessions and observations, different applications were addressed, as they relate within a curriculum structure.

NOTE: This form should be completed and included in the final report for all staff development activities.

PROFESSIONAL DEVELOPMENT FORM

Electronics, Electrical Occupations

School ittsburgh School District Participant Indus ial Elec. & Air Conditioning Position Teach s

Dates	Hours	Presenter	Description of Training	Impact of Training
5/ 3/84	2	Ms.Linda Thomas	Sex Harassment Workshop	It created an awareness of the subtle forms of sex harassment and discussed how unwittingly they can result in major problems.

NOTE: This form should be completed and included in the final report for all staff development activities.

School Pittsburgh School District Participant Drafting & Design Position Teachers

Dates	Hours	Presenter	Description of Training	Impact of Training
10/6/83	2	Project Coordinator	Overview of Teacher Training for High Technology project and begin substitute teacher lesson plan development.	Provided common subject lesson plans to be used by substitutes for duration of project.
10/10/83	2	Project Coordinator	Continue lesson plan development.	
10/20/83	8	Robert Morgan, Morgan's Computer & Education Center	Introduction to computer and peripheral devices.	Developed a level of confidence in the operation of computers and created the motivation for remainder of project.
	8		Training designed to provide skills necessary to introduce CAI into classrooms.	
11/3/84	4	Steve Beam, Monongahela Group	Introduction to CAD system and their peripheral devices. Sequences of skill development for curriculum were discussed.	This session provided the groundwork for CAD curriculum development.
11/3/84	4	Advisory Committee Meeting	Discussion of project and its implications	Recommendations as to where CAD should be offered within the curriculum.
11/9/83	8	Site Visitations	Two groups were formed and each visited a different CAD application site (e.g. electrical, mechanical and structural).	It provides the opportunity to visit industrial settings and observe first hand applications. Different manufacture of CAD units were also observed and evaluated.
11/18/84	8	Duan Richmond, Triangle Technical Institute	Triangle Technical Institute provided a full day, hands-on introduction to computerized drafting	It provided the teachers with their first experience at CAD Drafting. The day was spent actually operating a CAD system, thus affording the opportunity to apply things discussed and observed.
12/5/84	8	Site Visitations	Each individual was assigned an observation site.	It provided the opportunity to spend a full day observing one-on-one a CAD operator. In this manner questions could be asked and answered in preparation for introduction of CAD to the classroom.
	70			

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School Pittsburgh School District Participant Drafting & Design Position Teacher

Dates	Hours	Presenter	Description of Training	Impact of Training
5/23/84	2	Ms. Linda Thomas	Sex Harassment Workshop	It created an awareness of the subtle forms of sex harassment and discussed how unwittingly they can result in major problems.

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School Pittsburgh School District Participant Commercial Art Position Teachers

Dates	Hours	Presenter	Description of Training	Impact of Training
10/6/83	2	Project Coordinator	Overview of Teacher Training for High Technology project and begin substitute teacher lesson plan development.	Provided common subject lesson plans to be used by substitutes for duration of the project.
10/10/83	2	Project Coordinator	Continue lesson plan development.	
10/20/83	8	Robert Morgan, Morgan's Computer	Introduction to computer and peripheral devices.	Developed a level of confidence in the operation of computers and created the motivation for remainder of project.
10/27/83	8	& Education Center	Training designed to provide skills necessary to introduce CAI into classrooms.	
11/3/83	4	Steve Beam, Monongahela group	Introduction to CAD systems and their peripheral devices. Sequences of skill development for curriculum were discussed.	First exposure to terminology as related to computer graphics.
11/3/83	4	Site visitation Algor Interactive Systems	Opportunity to observe a CAD system and its capabilities at a vendor's site.	Exposed the individuals to one of the many computer graphics capabilities.
11/9/83	4	Site visitation Advertising Department, Pittsburgh Press	Visit a newspaper's Advertising Department and observe computer applications in layouts.	It provided the opportunity to observe formerly hand-constructed layouts now being done by computers in a fraction of the time.
11/9/83	4	Site visitation Geni-Graphics, Inc.	Visit a computer generated slide presentation facility.	It provided the opportunity to observe the total process of creating slide presentattions similar to those used for television. It introduced the individuals to the marriage of computers and 35 mm cameras.
11/18/83	4	Buhl Science Center, Ms. Jane Werner	Full day, hands-on computer generated art experience.	It provided the individuals the opportunity to sit down and manipulate a computer to generate art forms.
12/5/84	8	Site visitation	Each individual was assigned to spend a full day in a local television station art department.	It provided the knowledge that much of the art work formerly done by hand is now generated on a computer at the time it is needed.

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School P'tsburgh School District Participant Commerc l Art Position Teachers

Dates	Hours	Presenter	Description of Training	Impact of Training
5/23/84	2	Ms. Linda Thomas	Sex Harassment Workshop	It created an awareness of the subtle forms of sex harassment and discussed how unwittingly they can result in Major problems.

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